of LV outflow tract due to the cardiac tumor, and two cases had decrease of pre-load of LV because of giant tumor. Of 15 cases, eight terminated pregnancy and diagnosed cardiac rhabdomyomas by autopsy, two were followed-up after birth with one diagnosed tuberous sclerosis.

CONCLUSIONS Fetal cardiac rhabdomyomas is the most common cardiac tumor in fetus, which can be single or multiple. Multiple cardiac tumors are closely associated with tuberous sclerosis. Fetal echocardiography plays an important role in detailed diagnosis and prognosis evaluation of cardiac tumors.

GW26-e2148

Dissection of the Interventricular Septum Echocardiographic Features

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OBJECTIVES Dissection of the interventricular septum (IVS) is an extremely rare entity. Few cases have been reported. An institutional data base review identified 13 pts with the diagnosis that were confirmed by cardiac surgery. The purpose of the study was to determine the value of transesophageal echocardiography (TTE) in establishing the diagnosis and to summarize the TTE features of IVS dissection.

METHODS The 13 pts with IVS dissection, 8 males and 5 females (age range: 36-75 yrs; mean: 52 $\pm$ 12 yrs) were taken from 789,114 TTEs performed between 1985 and 2014. The etiology, location, two dimensional morphology, and color Doppler findings of the IVS dissection were noted.

RESULTS The incidence of IVS dissection in our center was 0.000016%. Among the 13 patients with IVS dissection, the right sinus of Valsalva (SOV) was involved in 11 pts. In 5 pts, a single aneurysm of the right SOV was seen dissecting into the IVS. In 4 pts, aortic valve endocarditis caused the IVS dissection, including one pt with bicuspid valve infection, 2 pts with abscess formation adjacent to an aortic valve replacement dissecting into the IVS, one pt. with a combination of a bicuspid aortic valve and right SOV dissected into the IVS, and one pt with an aortic prosthetic paravalvular leak following abscess formation dissecting into the IVS. In one patient, a bicuspid aortic valve combined with right SOV dissected into the interventricular septum. Also, in one pt, mechanical aortic valve prosthetic replacement was complicated by annular detachment and a severe paravalvular leak causing IVS dissection. In all 11 pts, TTE showed a dissecting cystic-like mass in the IVS from the base to mid-septum or confined to the septal base in all 11 pts. The path of the dissection in all these pts was traced to the right SOV. Also, communication between the dissection and the aortic root were seen in these 11 patients. In the other 2 pts, IVS dissection followed septal rupture due to a myocardial infarction. In these pts, communication between the dissection and the right ventricle was seen.

CONCLUSIONS The study showed that most dissections of the IVS commenced in the right SOV, due to either congenital anomalies, infective endocarditis or following aortic valve replacement. The TTE characteristic of IVS dissection is a cystic-like mass in the IVS. The other cause of IVS dissection is a myocardial infarction.

GW26-e2129

Premature Restriction or Closure of Foramen Ovale in Fetuses with Structurally Normal Hearts

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OBJECTIVES Premature restriction and closure of foramen ovale (FO) is associated with right ventricular remodeling, tricuspid regurgitation, pericardial effusion, heart failure and poor perinatal outcomes but data is lacking in this rare entity.

METHODS A total of 9704 fetuses were studied in Beijing Anzhen Hospital from 2010 to 2014. A complete fetal echocardiogram, including 2-dimensional imaging, color and pulse Doppler, was performed to ascertain the presence of restriction and/or closure of FO with or without septal aneurysm. Restriction of FO was defined as: (1) the diameter of FO<3mm, (2) FO Doppler >40 cm/s,(3) FO/aortic root diameter < 0.52, (4) FO/right atrial diameter <0.3. Closed FO was diagnosed as without a detectable right to left flow across the FO in the color Doppler. Perinatal course and follow-up have also been noted.

RESULTS In this large single-institutional cohort, 6707 fetuses had structure normal heart, 83 (1.23%) fetuses had restrictive FO and 5 (0.07%) had closed FO diagnosed between 23 and 37 weeks of gestation. Right atrial and/or ventricular dilation was noted in 32 (36.4%) fetuses, tricuspid regurgitation in 19 (21.6%) (9 with moderate or severe regurgitation), pericardial effusion in 10 (11.4%)(3 with moderate pericardial effusion). Three (3.41%) died in neonatal period and 2 had abortion and 29 lost for follow-up.

For autopsy (n=2), nearly closed FO was found in both fetuses and one had abdominal infection and one had atrial rhabdomyoma. For neonatal mortality, one is delivered in 28 gestation weeks and died after 4 days, the fetal echocardiography showed a closed FO with severe mitral regurgitation and severe tricuspid regurgitation, a decreased ejection fraction of left and right ventricles, moderate pericardial effusion, severe hydrothorax and severe ascites. The other one is detected restrictive FO with a diameter of 2.5mm in 30 gestation weeks. The maternal delivered because of severe preeclampsia and placental abruption; the neonate died 3 days after birth because of a neonatal asphyxia. For two neonates died after birth, the umbilical artery S/D is both higher with the value is 4.15 and 3.8 respectively.

CONCLUSIONS Both premature FO restriction and/or closure are rare in fetuses with structurally normal hearts. They may cause right atrial and ventricular remodeling, tricuspid regurgitation, pericardial effusion, fetal hydrops and fetal and neonatal mortality and significant morbidity. Close follow-up in the last trimester is critical for fetuses with FO restriction or closure.

GW26-e0398

Fibroatheroma Morphological Features of Borderline Coronary Lesion Plaques on Stable Angina Pectoris Patients

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OBJECTIVES The aim of this study was to report the patient and lesion-related specific morphological characteristics of borderline coronary lesion plaques responsible for stable angina pectoris.

METHODS We analyzed 86 borderline coronary lesion plaques from stable angina pectoris patients by using virtual histology-intravascular ultrasound. Plaque burden and lumen area were measured with intravascular ultrasound (IVUS). Compare patients characteristics, laboratory findings, coronary artery disease distribution and virtual histology-intravascular ultrasound (VH-IVUS) detected thin-cap fibroatheroma(TCFA) and thick-cap fibroatheroma(ThCFA) phenotype groups.

RESULTS Analysis the borderline coronary lesion plaques, the ratio of fibroatheroma are major, next is PIT, and FT is the least. TCFA and ThCFA occupied only 1/4 and 1/3proportion of the plaque lesions, which means that few borderline coronary lesions, belonged to "vulnerable plaque". Fibrofatty and dense calcium tissues improved significantly in TCFA group (P<0.05), and VH-TCFA III, IV were the major types of subtypes, 45.9%, 43.3% repressively.

CONCLUSIONS These findings suggest that for angina pectoris with borderline coronary lesion plaques, TCFA occupied only 1/4 proportion of the plaque lesions, the clinical characteristics similar to ThCFA patients, which may be responsible for the cardiovascular events.

GW26-e1087

In vivo ultrasound molecular imaging of SDF-1 expression in a swine model of acute myocardial infarction

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OBJECTIVES Stromal cell-derived factor -1 (SDF-1) plays a pivotal role in the homing of stem cells to an injured myocardium. The purpose of this study was to determine whether contrast-enhanced ultrasonography that targets SDF-1 might facilitate the molecular imaging of SDF-1 expression in a swine model of acute myocardial infarction (AMI) *in vivo*.

METHODS Three of the 24 *miniswine* were randomly selected as the control group (n=3, sham operation); the remaining 21 *miniswine* underwent ligation of the left anterior descending coronary artery (LAD). Three animals were died, so the remaining 18 *miniswine* was randomly assigned to one of the six experimental groups (n=3, the groups were divided based on the duration of the myocardial infarction). All animals were injected with a targeted microbubble ultrasound contrast agent (T + T group) and a normal ultrasound contrast

agent (T + C group). The values of the myocardial perfusion parameters (A, β, and A × β) were determined using Q-Lab and SDF-1RT-PCR analysis after death. The correlations between the myocardial perfusion parameters and the SDF-1RT-PCR results were analyzed.

RESULTS The trend in the myocardial perfusion parameters in the T + T group was consistent with that in SDF-1; they both peaked at 1 w, after which they began to decline.The A and A × β values were correlated with SDF-1 in the T+ C group (r=0.547 and 0.506; P<0.05); the A, β, and A × β values were correlated with SDF-1 in the T + T group (r=0.887, 0.892, and 0.942; P<0.05 and P<0.01). Regression equations were established for the relations of the A, β, and A × β values (X) with SDF-1 (Y): Y=0.699X - 0.6048, Y=0.4698X + 0.3282, and Y=0.0945X + 0.6685, respectively (R^2=0.772, 0.7957, and 0.8871; P <0.05 and P < 0.01).

CONCLUSIONS A targeted microbubble ultrasound contrast agent could be used to evaluate the characteristics of the variation in SDF-1 over time and for the analysis of SDF-1 content *in vivo* after acute myocardial infarction.

GW26-e2186

Application of combined echocardiography STIC and computational fluid dynamics (CFD) technique in the study of fetal aortic isthmus coarctation hemodynamics

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OBJECTIVES To explore the digital model of normal fetal aortic arch(Aar) and arterial duct(AD) by combined fetal echocardiography STIC (spatio - temporal image correlation) and CFD(Computational Fluid Dynamics) technique, and through establishing the model of coarctation, to provide a more detail hemodynamic data information for deep insight into its biological physical state.

METHODS Collecting fetal echocardiography 4D volume and the consecutive ultrasonic tomography images of short axis and long axis of fetal Aar and AD were obtained by using 4d Volume with STIC; after extracting its border by the Havon software, the 3D digital model reconstruction of above structure was completed by the CAD software, and the CFD method was used to omnidirectional display the fetal blood flow pressure, streamline and wall shear stress(WSS) within the Aar and AD, and to simulate and demonstrate the complex hemodynamic model of coarctation.

RESULTS The fetal echocardiography STIC can provide the ultrasonic tomography image to realize the 3D digital model of Aar and AD by CFD technique. This CFD digital model showed that the obvious vortex flow existed in the dorsal part of the initial segment of aortic arch branches arteries, the abounchement of arterial duct and the greater curvature side wall of the original segment of descending aorta, and displayed the fetal blood flow pressure, streamline and WSS in coarctation was significantly higher than other vessel walls.

CONCLUSIONS Based on the Aar and AD multiplanar images of fetal echocardiographySTIC, the 3D CFD digital model can be reconstructed and the complex blood flow model showed by the 3D CFD digital images of coarctation can provide hemodynamic explanation to its pathogenesis.

GW26-e2356

Appraise Risk of Plaque Using a Bimodal Gamma Statistical Model Base on Gray-level Distribution of Carotid Plaque Ultrasound Images

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OBJECTIVES The purpose of this study was to classify plaques between different echogenicity using a bimodal Gamma statistical model base on gray-level distribution of carotid plaque ultrasound images.

METHODS Ultrasound images were obtained from a total of 137 carotid plaques and cross validation was implemented in this study. After images were normalized, gray level distribution of carotid plaque ultrasound images were obtained in Photoshop software. In Matlab, an internal fitting function base on nonlinear least square method, called lsqcurvefit, was used to get the curve of bimodal Gamma distribution base on gray-level distribution of carotid plaque ultrasound images. Lastly, plaques between different echogenicity were classified according to the error between gray level distribution curve of carotid plaque and the statistical model curves.

RESULTS The classification accuracy of hypoechoic, intermediate and hyperechoic plaques were 75%, 65% and 100% respectively.

CONCLUSIONS The bimodal Gamma distribution was reasonable fit to the pixels of carotid plaque ultrasound images, and it had a high accuracy in identifying hyperechoic plaques. It is a promising tool for risk assessment of atherosclerosis.

GW26-e2956

Quantitative Analysis of The Blood Flow Fields in Aortic Arch by Vector Flow Mapping in Normal Humans

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OBJECTIVES To visualize and quantify the hemodynamics of the aortic arch in normal individuals using velocity distribution, vortex formation, energy loss at different cardiac cycles.

METHODS VFM analysis was performed using echocardiography in 87 healthy volunteers(40males), mean age 35.2 ± 19.4 years (range19-69), and focused on the velocity vector fields of the ascending aorta, 4-5cm below the opening of the brachiocephalic trunk, as well as the descending aorta, 4-5cm below the left subclavian artery. Both of them were divided into three different sections equally: the proximal section, the middle and the distal section.

RESULTS The following main features were observed: 1.(i): In different sections of the aortic arch, a skewed peak flow velocity (Vp) always appeared in the period of rapid ejection but in different distribution. Vp arose towards the inner wall curvature in the proximal section of the ascending aorta, however, it appeared along the outer wall of the ascending aorta in the middle and distal sections. Vp in the three different sections of the descending aorta all showed along the inner wall. Vp in the proximal, middle, and distal section of the aorta are respectively 72.78 ± 12.58cm/s, 64.62 ± 17.80cm/s, 48.22 ± 11.67cm/s, which of the descending aorta are respectively 58.20 ± 13.55cm/s, 74.25 ± 12.49cm/s, 59.93 ± 12.90cm/s. (ii): The systolic flow in the entire aortic arch rose rapidly from near-zero at the point of isovolumic contraction to the peak velocity at the period of rapid ejection, then decreased gradually in the residual systole. Whereas, compared with systolic flow, the diastolic flow in the aortic arch was much lower, and there was no obvious change of the flow velocity in diastole. 2. In the period of isovolumic relaxation, vortex formation were observed in almost all subjects in the descending aorta but occasionally in the ascending aorta. 3. The energy loss was 13.50 ± 8.07 J/(m^2 s) during systole and 2.83 ± 3.56 J/(m^2 s) during diastole in ascending aorta and 15.29 ± 12.26 J/(m^2 s) and 2.61 ± 2.00 J/(m^2 s) in descending aorta.

CONCLUSIONS VFM can provide insights into the intra-aortic arch flow patterns, and offer essential fundamentals about flow features associated with common aortic diseases.

GW26-e3961

Correlation between the degree of plaque inflammation and adventitial perfusion in the carotid artery: a combined 18F-fluorodeoxyglucose positron-emission tomography and dynamic contrast-enhanced magnetic resonance imaging study

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OBJECTIVES Recently an increasing body of evidence has suggested that the plaque inflammation was influenced by the adventitial perfusion, and which has been confirmed to be quantified by ^{18}F-fluorodeoxyglucose positron-emission tomography (PET/CT) and dynamic contrast enhanced magnetic resonance imaging (DCE-MRI) respectively in the carotid artery. However, there were no studies to confirm the relationship between plaque inflammation and its adventitial perfusion by invasive imaging modalities. The purpose of this investigation was to use PET/CT and DCE-MRI to determine whether the adventitial perfusion is associated with plaque inflammation in the carotid artery.

METHODS 49 patients with transient ischemic attack or minor stroke in the carotid territory and the intimal-medial thickness of ieipsilateral carotid artery ≥ 2mm (detected by ultrasound) were included. All patients underwent both PET/CT and DCE-MRI within 2 weeks. Kinetic modeling of the DCE-MRI time series was performed to estimate the adventitial plasma volume (v_p) and transfer constant